

INSECTS INJURIOUS TO FOREST TREES IN SOUTH AFRICA.

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Considerable research has been devoted to Entomology in South Africa, but the result has been mostly a nomenclature of the insect fauna and scarcely anything more.

An immense number of insects has been collected as far back as the end of the last century, by travellers and naturalists such as Le Vaillant, Thunberg, Burchell, Delalande, Waalberg, and a host of others and, has enriched the Museums and private collections in Europe. Descriptions of many of those insects, of most of them in fact, have been published; but, so far, nomenclature alone has benefited by the collecting of these men. That nomenclature is absolutely necessary, is undeniable. That it has been the means already of producing an immense revolution in philosophical views and ideas, cannot be doubted, for, without a nomenclature, how could the examples or proofs of the theory of evolution and natural selection have been presented to the mind. That words are mere symbols, either material or mythical, must be recognised as a fact, and it is a fact also, that, unless an animal (or a plant) is symbolised with a name or a name with an animal, it would be impossible to conceive anything like the object the philosopher speaks of.

But nomenclature alone must not be the goal which a Zoologist must aspire to reach. His object must be also the economy of the animal or animals he has assumed to study, and as the study of the life habits of insects injurious to forest trees in South Africa has not been attended to yet, the object of this modest paper is, not naturally to speak of a thing we have no knowledge of, but to sketch as it were, the lines on which to proceed to arrive at some knowledge on the subject.

If the geographical distribution of insects in Europe proper, their habits, primary stage, their economy in nature are so well known now-a-days, the fact is due: 1st, to the wars of the end of the last and the beginning of this century which, making travelling a matter of much danger, prevented, to a great extent, the arrival in Europe of numerous specimens of Natural History from distant countries, thus compelling the observers to resort to the fauna of their native land; and 2nd, that there are in Europe men, many men, whose means or tastes enable them to prosecute their researches *con amore*.

I am afraid that the same may not be said of this Colony. Pursuits of different kinds tending to the same end, to which a friend of mine, who is rather cynical and who calls a spade a spade, gives the name of "filthy lucre" seem to make the colonist a practical kind of individual, who is not, as a rule, disinclined to look with a contempt somewhat allied to pity upon a collector of "bugs and flies," and if perchance a more enlightened member of the Executive places a very, very modest sum on the Estimates, either for the keeping of a museum, or still more seldom, for investigation or researches in Natural History, it is not without loud grumblings that the modicum is voted, when it is voted at all.

These remarks are, I believe, necessary to explain how so little

has been done in the Cape Colony, for investigation into the life-habits of those insects that are injurious to vegetation in general and forest trees in particular.

It is only lately that a Forest Department has been formed. The head of the department, Count de Vasselot, has succeeded in bringing together some specimens of the indigenous woods, and in having them exhibited in the Forestry Exhibition of Edinburgh, where a gold medal was awarded to the Cape Colony. The sundry kinds of woods must, then, have been admired, or at least, thought worthy of attention, and, for all we know, may become a source of revenue for the Colony, under a careful and systematic plan of forestry regulations.

Now, the insects, mostly or almost exclusively coleopterous (with the exception perhaps of certain moths of which more anon), have a very great influence on forest trees. In truth, a giant of the forest will succumb before the attacks of an insect one line long. What a single *Scolytus* cannot do, thousands will, and they do it too, because their number is legion. Many times in looking at some of the larger forms of *Prionidae* (a few of which I exhibit), the fact that a single one of these has perhaps caused the utter destruction of a noble tree that took years to come to a perfect state, until the auger of a female of those insects selected its surface in which to deposit an egg, has forcibly been brought to my mind.

I do not pretend to say that a knowledge of the life-habits of the insect or insects, thus causing damage to trees, will enable one to eradicate the evil; but it will go far towards finding a remedy for it, and I will give as example the case of the European long-horn "*Cerambyx heros*." Common formerly, near Paris, according to Blanchard, it is now very scarce, and that, because from the moment that its life-habits have become well known, man has been able, knowing where, when and how to find it, to cope with it successfully and to reduce its ravages to a minimum.

Being, unfortunately, without any knowledge of the habits of life of ligniperdous South African insects, I must treat by analogy of those which happen to be noxious elsewhere, and which according to their natural affinities, *must* be noxious also in South Africa.

As I have stated before, the coleopterous order of insects is that which causes most damage to trees, and, as I have devoted eight years to forming a collection of South African Coleoptera, I have been able, I believe, to arrive at an approximate idea of their affinities.

DISTRIBUTION OF INSECTS.

The forests, or bushes, as they are termed in colonial phraseology, are comparatively of small extent. They are mostly found in the eastern part, beginning from Plettenberg Bay, and extend along the sea-coast, as far as Mozambique. Nowhere is, I believe, this more exemplified than near Durban, Natal, which possesses a luxuriant semi-tropical vegetation, which ceases entirely as one advances into the interior of that Colony. If we take the western parts, we find a stunted vegetation; and here and there a clump of trees, mostly thorn (*Acacia horrida*) some Karee Boom (*Rhus viminalis*), except in kloofs in which a few indigenous trees are still found, where the work of denudation by the axe has been hampered for some reasons. Some mountains have a few *Proteaceae*. That rarity of trees implies

naturally a rarity of insect-life in general, and mostly of wood-boring insects. But the more we advance towards the east, the more numerous trees become and the more numerous is also the insect-life, which reaches its maximum when we come to the borders of Natal along the sea coast. The forests of Kaffraria have not yet, as far as I know, been well explored for the purposes of Entomology, nor has the Knysna forest. But we may take for granted that the Port Natal forms are found in the Kaffrarian forests, although perhaps in lesser numbers, because there is no natural barrier between the two borders.

We have then two distinct fauna—the western and the eastern; in the latter I include the northern. The western part with barren wastes, few trees, subject to intense droughts and with the hotter and more northern parts separated from the corresponding ones on the east by the Kalahari Desert.

The typical timber-loving insects there are the *Julodis* family of Buprestidae; lovely insects whose bodies covered with long tufts of hair make them so well adapted to the fertilisation of the flowers of the *Acacia horrida*, which is their favourite resort; a few longicorns, three species of which, *Ceropalesis Æthiops*, *C. hottentota* and *Zographus oculator*, are very numerous. Now and then, one meets with some large form of *Prionidae*, *vid.*: *Tithoes capensis*, *Cacosceles Œdipus* and *C. latus*, all of them rare; also with *Herioderus hirtus*. *Tithoes capensis* found in Beaufort West and near Kenhardt, seem to me to imply the disappearance of trees in those localities. The *Cacosceles latus* comes from Namaqualand.

The Northern Border of the Colony formed by the Orange River, the banks of which are clothed with a dense vegetation, has not been much explored. But the banks of the Vaal River, an affluent of the Orange River, has yielded a certain number of specimens which, added to a few collected near Upington by the late Dr. Bradshaw, enable me to say that as far as I at present know, the coleopterous forms are related more to the splendid fauna of the Magaliesberg Range near Rustenburg, in the Transvaal, than to the Port Natal forms. We can easily understand that insect-life has been preserved all along the wooded banks. There, seems to be the limit of habitat of the large *Prionus*. "*Tithoes confinis*," also found in Senegambia, Rustenberg and Mozambique, and whose larva, judging by that of allied genera, is one-fourth longer than the insect and a little broader. That larva would naturally be fatal to the tree it attacks. We must notice also that it is on the banks of that river that the *Euclea pseudebenus*—Cape ebony—and the Camel thorn—*Acacia giraffae*, both woods of the hardest texture, grew. I purposely say grew, because those valuable trees have now well-nigh disappeared before the wants of the Kimberley market for fuel. The eastern part of the Colony, including Plettenberg Bay, possesses but few typical insects; they are mostly the Natal forms, in the same way that those Natal coast-forms are akin to those of the Transvaal, although separated from the latter country by a comparatively treeless tract, and by several plateaux; the connection taking place very likely through Zululand; but Delagoa Bay, which is the limit for us, at present, is decidedly Mozambican in forms.

Of the extreme western part of the Colony, Damaraland, I cannot say much, having seen but few insects from those parts, but I exhibit, nevertheless, a *Prionus* from that country, allied to, if not identical

with, the "*Dorycera spinicornis*," from Fernando Po on the West Coast.

NUMBER OF SOUTH AFRICAN COLEOPTERA.

The number of South African described Coleoptera compiled from the Munich Catalogue amounted 10 years ago to 4,920, not including the family of *Staphylinidae*. In that number are included the insects from M zambique in the East, to Damaraland in the West. But many of the Mozambican insects described in Peter's "Reiss nach Mozambique," are also found in Delagoa Bay; many, if not most, of the few from Damaraland, described in Boheman's *Insecta Caffrariae*, are found in the Transvaal; most of the Transvaal insects are found in Natal and many of them on the Orange and Vaal Rivers, and doubtless those Natal forms are also found in the adjoining districts of Kaffraria so that, it may be said, that fully two-thirds of that number inhabit Cape Colony proper, and if we add those insects, new to science, contained in the South African Museum collection and in my own, we come to the respectable number of about 3,250 species of described Coleoptera, a very large number indeed.

Of South African wood-eating beetles, either ligniperdous (that is to say devouring wood) or living in the decomposed timber, either in the larval state, or in the imago (perfect state), being those bearing relation to the devastation of trees, I will enumerate the families and number of known species. Before, however, giving that enumeration, I should explain that, with the exception of the whole family of *Bostrichidae*, sufficient proofs have not been forthcoming to show that so-called xylophagous insects necessarily cause the death of living trees or at least of those that are healthy.

I am rather inclined to think that the contrary is the case. The instinct, I almost said the intelligence, of insects is truly wonderful, and I can hardly believe that small insects, in small numbers, attacking a tree in very healthy condition, can make or pierce galleries impairing the health of the said tree, without some attempt being made in the part of the tree itself to get rid of its enemies by an abundant flow of sap or rosin, or such like matter. The minute larvae must necessarily be drowned in their galleries by that flow of sap. But when the insects attack the parts of trees already deteriorated, the tree will have no remedy against the intruders, because the neighbourhood of the parts so affected is already in a morbid condition which will be accelerated or spread, as the holes bored by the insects will admit damp and, therefore, minute fungi following in their suite. You have, doubtless, noticed how quickly the timber in such affected parts becomes deteriorated, and the entomological collector can safely expect to find an ample harvest of insects in the humus thus accelerated if not caused mostly by insect agency. Certain forest trees have a wonderful vitality. We have an instance of it in some of the avenue oaks in Cape Town, some of which are perfectly hollow and yet apparently healthy. Now, since they have been (under the supervision of Mr. De Vasselot, the Superintendent of Woods and Forests) freed from the decayed branches, and all the interstices carefully cleaned, filled with cement, and tarred, to keep the insects off, their old sores have mended wonderfully, and in fact, some of the cavities have been naturally filled, over the cement, by the growth of the adjacent liber, and will hardly show any scars

in time to come. And that the effect of the tar in keeping away the insects has been most beneficial I can testify, having carefully observed it since the beginning of last year.

I will ask you therefore to bear in mind that those insects that live, or whose larvae live in decomposed *standing* timber, are no less pernicious indirectly than those who live in the tree itself, because, first, they are much more numerous, and secondly, that they occasion a rapid disintegration of the fibre, enable the water to percolate, and cause often that black stain called "dry rot" in Knysna, so noticeable among other timber, in the Outeniqua Yellow-wood—*Podocarpus elongatus*.

FAMILY NITIDULARIAE.

The larvae and imago of some species live in rotten wood, also in fallen timber, in damp places. Some species are very numerous in the chinks and crevices of the oak-tree "*Quercus pedunculata*." We have only 28 species described, but I expect that this number will be more than doubled. They are all small.

FAMILY CUCUJIDAE.

The form of these insects which is extremely depressed, points at once to their mode of existence. They are generally found under the bark of trees, and so are the larvae. It is not quite certain that they live on wood, some Entomologists think that they prey on insects, but I am inclined to believe that they are xylophagous. I only know three species, 1 *Hectarthrum* from the Transvaal and the banks of the Zambezi, and two *Parandridae*, one the "*Catagenus carinatus*," found in the silver-tree "*Leucodendron argenteum*," and another from the Transvaal. All those three species seem to be rare.

LUCANIDAE.

The larvae of that family live in decomposed timber, in the rotten trunks and forks of standing trees. We have only seven species. The genus *Colophon* with two representatives is strictly South African. It is rather singular that there should be so very few representatives here of this wood-loving family, and we have an instance of the natural barrier caused by the absence of forests in the western side, to the mingling of one fauna with another. The West Coast of Africa possesses many species of the genus *Cladognathus*, allied to the English well-known Stag-beetle, but the only representative here of this genus *C. natalensis*, whose appearance is very peculiar, is found in the extreme eastern parts of the Colony, Natal and the Transvaal. The affinity of forms in that region lies with the eastern coast of Africa, and no *Cladognathus* has been found there until now. This is a singular case of isolation.

SCARABAEIDAE.

Of this considerable family, the tribe "*Melolonthidae*" feeding only on leaves when in the imago state, is the only one known to be seriously injurious to trees, for it has been ascertained that the growth of the concentric rings in those trees, the foliage of which is devoured by the cock-chaffer, *Melolontha vulgaris*, was greatly impaired. We have no true *Melolontha*, but a closely allied tribe, the *Macrophylidae* includes the *Leontochaeta alopex*, an hirsute beetle of good size,

which is found at times in great number, I am informed, on the peach-trees. But that family does not really come within our range, although the larvae of one of the sub-tribe, the *Oryctidae*, to which belong the so-called Rhinoceros beetle, "*Oryctes Boas*," so common in the east, and found also in Senegambia, live in old trunks. Near Cape Town, the larva of an allied species, *Cyphonistes corniculatus* is very common on the Cape flats, under the mounds of a species of *Termes*—white ant. Must we see there an instance of struggle for existence brought by the denudation of that part of the country? No less than 645 of those leaf and fruit feeding insects are described from the Cape.

It is to that family that the gigantic insects of the genus *Scarabæus* proper, *Megasoma* and *Goliathus*, belong. Some of them are bigger than a man's fist. The *Scarabæus Hercules*, of the West Indies, is said on no less an authority than Lacordaire's to seize young branches between the long horns his head and prothorax are armed with, and to cut them by a rapid rotating flight. We have only one true *Goliathus* of comparatively small size. It is found near the Magalisberg Mountains, in the Transvaal.

BUPRESTIDÆ.

224 S. African species.

The larvae of these insects live mostly in decaying wood, many of them between the bark and the wood of unhealthy trees, but many also in trees in good condition. For these insects (as well as for the *Scolytidae*), it is not certain whether they cause the death of trees, or if they only select those that are beginning to decay. The females are provided with a horny auger, composed of three pieces, with which they drill holes to deposit their eggs in. I exhibit the larva of one Buprestis, either a *Julodis* or a *Chalcophora* which was sent to the Museum by Mr. Garwood Alston. It is unfortunately dead.

The most numerous of that group in S. Africa are the *Julodis*. These lovely insects, in spite of the damage they must occasion to timber, are of some use in the Economy of Nature, because I consider them as the most powerful instruments of fertilisation, mostly of the flowers of the Thorn-tree, "*Acacia horrida*." The genus *Julodis* is represented in Nubia, Senegal, Arabia and Syria, but it is only those inhabiting South Africa that are provided with those curious tufts of hairs. The duration of the metamorphosis of the Buprestidæ is very long. An instance has been recorded of the *Buprestis splendida* emerging from a deal table, which had been used for more than 20 years. Mr. S. Windham, of Maritzburg, informs me that he has repeatedly captured the *Psiloptera viridimarginata* on the stems of a small plantation of conifers.

This would seem to be a habit of the European species. If I mention the fact of the *Psiloptera viridimarginata*, showing such a natural taste for the conifers, it is because of the damage done to the Forests of the South of France, by a species of that family, the *Coræbus bi-fasciatus*, oliv, a small insect, which was ascertained to be rare less than 30 years ago, and which now seems to defy all the powers that be in Forestry. It is probable, nay, it is likely that the re-wooding of the Colony will be made mostly with European timber; the valuable Cape trees being of slow growth on the average. We have no less than 15 species of that genus, *Coræbus*, in South Africa.

It is to be hoped they will not emulate their congener, but hardly to be expected.

EUCNEMIDAE.

The larvae of that family tunnel in trees that have died recently. 3 species are known.

ELATERIDAE.

96 species. Some of those are gigantic. The genus *Tetralobus* includes 7 species. I have been able to capture the larva of the *Alaus mærens*, which is considerably larger than the perfect insect (the larvae of the Buprestidae and Elateridae contracting much when assuming the chrysalid state). I found that larva in a dead standing trunk of oak, which was perfectly riddled by large galleries. On the outer bark was a single hole, and although I searched diligently for more grubs, tearing the tree to shreds; nevertheless I found but one. I had that larva for thirteen months without noticing any increase in its size. But when I opened yesterday the receptacle I kept it in, I found that the larva which I had not examined for a month, had assumed the imago state, but was still very soft. The chrysalis state, as you can see, is of short duration; not more than one month. The perfect insect is often found feeding on the sap exuding from the oak. I also have captured it on the cluster pine. The grubs of that family are known in England under the name of wire-worm, and the perfect insect as skip-jack.

PTINIDAE.

It is mostly in dead wood or cut timber that those insects are met with. 3 species of the genera *Ptinus*, *Anobium* and *Dorcatoma* are known. The *Anobium* has probably been imported.

BOSTRICHIDAE.

If the *Ptinidae* attack only dry timber, the *Bostrichidae's* attacks are only on living trees, and the damage done by them is very great. They are essentially ligniperdous. Provided with extremely strong jaws, they make a hole in the living trees, penetrating to the core, and almost always cause death. Cases have been authenticated of larvae of *Bostrichidae* having perforated some leaden roofs and also typographic plates. Professor MacOwan has communicated to me a species of *Apate*, which I believe to be the *Apate frontalis* Fahreus, and the Museum has received a specimen of the same insect from Col. Bowker, who says that it causes great damage in Natal. I have received a species of *Synoxylon*, found in a piece of Mimosa firewood, but I have not been able to find out whether the wood had been freshly cut, which I surmise to be the case. The grub of *Bostrichidae* is a fat, legless rounded creature, very much the shape, though very much smaller, of the larva of the *Cyphonistes*, I have shewn you. We have 19 species of *Bostrichidae*. One of them, *Apate muricata*, from Leydenburg, is also found in old Caiabar.

While preparing the woods for the Forestry Exhibition, I found every morning, under some logs of freshly cut Sneezewood, *Ptaeroxylon utile*, little heaps of fine yellow dust; when turning those logs, new heaps were forced on the upper side. I knew at once that I had before me the result of the work of *Bostrichidae*, and when I had those logs sawed into planks, I found numberless galleries spoiling

the rich-yellow alburnum or sap-wood, to the distance of one inch from the surface, and tenanted by small fat grubs who had hastened to close the orifice of their galleries by agglutinated saw-dust. I was not able to retain the planks, and wait for the development of those insects. The similitude of the larvae of the Ptinidae and Bostrichidae is so great, that I cannot venture to ascribe to which family those larvae belonged.

Cedar-wood is supposed, on account of its fragrant smell, to be distasteful to insects. But I found our blocks of Cedar (*Widdringtonia juniperoides*) tenanted by numbers of a little *Bostrichus*, less than 1 line long, and I was greatly amused to watch a small Ichneumon fly very numerous also, entering every hole, looking evidently for the larvae of the *Bostrichus* to deposit its eggs in. The damage done by the *Bostrichus* was not great, however, only the bark and a little of the sap-wood being perforated.

TENEBRIONIDAE.

Of that family, few species, belonging mostly to the tribe Helopinae, are known to be injurious to trees. Yet I have found the gregarious Helopid "*Zophius rufopictus*" in the decaying trunks of the willow "*Salix capensis*," and also in the crevices of fencing poles made of poplar.

CURCULIONIDAE.

In their perfect state—imago—the *Curculionidae* or weevils are mostly inoffensive, but in their primary stage, they are among the most injurious of insects. There is really not a single vegetal, says Mr. Ed. Perris, whose bud, leaf, stem, bark, wood, sap or root, is not attacked and destroyed by those insects. We have no less than 1,073 kinds of those pests in S. Africa. Most noticeable among the tree-haunting species, is the large *Mecocorynus loripes* (exhibited in drawer No 3). Dr. Becker, of Kowie, sent some time ago to the Museum some branches of the Kaffir Plum-tree, *Harpephyllum caffrum*, on which that weevil is found, which had circular holes on the outside. He suspected those galleries to be made by the larvae of the *Mecocorynus*. But on inspection, they were found to be due to the larvae of a Longicorn, probably either the *Erioderus hirtus* or the *Megopsis modesta*. The larva of the *Sphadasmus camelus* (exhibited in drawer No. 7) constructs an earthen cocoon, which it affixes to the stem of a tree, which I have not been able to identify.

BRENTHIDAE.

16 species. All of them are truly xylophagous, but apparently scarce.

ANTHRIBIDAE.

28 species, living mostly in standing dry timber. The *Ischnocerus nigellus* is common round Cape Town, but seldom have I captured it on indigenous trees, except on the *Salix capensis*. The poplar seems to be his favourite haunt, and it is easily captured on the fencing poles made of that wood.

SCOLYTIDAE.

The representatives of that family are the tree-destroyers par excellence. Fortunately for us, six species only are described from S.

Africa, and, although they may be common in the wooded districts, I have only captured 4 specimens of one *Hylurgus*, I believe, near Cape Town, and have never here met with any sign of their presence. No doubt the number of species will be increased by further systematic research. *All the Scolytidae attack living trees.*

In the adult state, they notch the bark of trees to extract the juice. The female gets under the bark and hollows out a gallery, making series of notches in the sap-wood as she goes on, in which she deposits an egg. The larvae after they are hatched from the egg deposited by the parent insect, begin to gnaw the alburnum or sap-wood and form parallel tunnels proceeding on all sides from the central one, on which the eggs were placed, and form thus a most curious labyrinth. They choose for their resort the trees, the wood of which is of a hard texture. I have noticed traces of the presence of those in the Hard Pear, *Olinia capensis*, and White Pear, *Pterocelastrus rostratus*. I am not quite certain that I have also noticed traces in the Iron-wood, *Olea capensis*.

Through interruption of the flow of sap, and admission of wet between the bark and wood, decay speedily ensues.

The damage done by the Scolytidae has caused a great divergence of view among Entomologists and Foresters of great repute. Some, Ratzeburg among them, maintain that they attack the healthy trees; others, that they select only those trees which, without being exactly in a state of decay, are not in healthy condition. Audouin has gone further, and states that the female *Scolyti* never lay their eggs but on trees which are in a declining state, and that the healthiest elms on which the *Scolyti* abound, are constantly brought into this languishing state by the attacks of the males upon the bark, for food, so that, in consequence of the loss of sap from the numerous holes which they gnaw, and the subsequent mischief from the rain penetrating into them, the trees are soon brought into that unhealthy condition which the instinct of the female requires, to induce her to lay eggs in them."

It seems however to me that the punctures would determine in healthy trees, a flow of sap which would infallibly drown or agglutinate the newly-born larvae; but on the other hand, although those insects are very small, their number is so great that the extravasation of sap may not be in sufficient quantity to choke the young larvae of all the Scolytidae, although causing the destruction of many.

LONGICORNIA.

Some larvae of the insects composing that family, gnaw the bark only without touching the wood; others excavate very deep in the heart-wood (duramen) and some attack even the medullary substance. If the damage caused by them is less great than that caused by the *Bostrychidae* and *Scolytidae*, because they are undoubtedly less numerous; yet, the large size of most of them compensates for their numerical inferiority.

Although not always destroying entirely full-grown trees, they nearly always cause the death of young ones. But it is when the trees are felled and left to season, that they suffer most from those insects, and some species abound in timber yards, causing great losses to the owner, and attacking even those logs which are shorn of the

bark,—the best preventive remedy against the attacks of the xylophagous insects generally.

The largest examples of that family are the *Prionidae*, 14 of them known in S. Africa. The damage done by the *Tithoes confinis*, must be very great. In fact, I attribute to it, or to its congener, the *T. capensis*, the galleries, 1 inch deep and 1 inch broad, excavated in the sap and heart-wood of a small piece of Cape Ebony (*Euclea Pseudebenus*), a wood of extremely hard texture. I thought to be able to exhibit this little log, but I found that it has gone to Edinburgh.

The small *Delochilus prionides* is not uncommon near Cape Town, and I found the larva, a cylindrical legless one, in the Poplar tree, the Keurboom, *Virgilia-capensis*, and the oak. The *Erioderus hirtus*, sometimes met with here, is common in Knysna. I captured a female of that species in a healthy *Proteaa grandiflora*, in the Hex River mountains. The *Cacosceles Aedipus*, an insect rare in collections, I found in the same place, in a decaying oak-tree, tunnelled perpendicularly by what, I have no doubt, was the larva lately emerged. In Natal, the extreme East, and also on the Orange River are found the large *Macrocoma*. The whole family numbers in S. Africa, 303 species, mostly all of large size, and of the tribe *Cerambycidae*, three of them only, the size of the *Cerambyx heros* too well known in Europe on account of its destructive powers. This closes the list of Coleopterous insects known or suspected to be injurious to forest trees in South Africa.

LEPIDOPTERA.

Of the Lepidoptera, Butterflies and Moths I will say little, because I know but little about that Order.

The genus *Cossus*, to which belong the English Goat Moth, *Cossus ligniperda*, injurious in Europe to nearly all kinds of timber and fruit-trees, possesses here two representatives only: that is to say as far as is known to Mr. Trimen. A tolerably large caterpillar, very beautifully marked, has been sent to us from the neighbourhood of Carnarvon, by Mr. Garwood Alston, to whom I am indebted, as also to his son, for several discoveries in the primary stages of several beetles. It feeds in the wood of a ligneous *Mesembryanthemum* (*M. junceum**), the ash-bush of the Colonists. The other *Cossus* is found in a *Buddleia* sp. ?; it is the *C. tristis* (*Drury*).

The grand Silver Moth (*Leto Venus*) found only in Knysna, I believe, haunts the Keurboom (*Virgilia capensis*) only, it is said. The Bombycid moths of the family *Saturniidae* have here about 20 species, mostly all of large size. Some of them are omnivorous, and residents on the Camp Ground are, doubtless, too well acquainted with the large deep red, green and yellow-spotted one, which devours so speedily the leaves of the pine-tree. It is the larva of the *Antheraea Cytherea*. But the ravages of these Bombycidae are limited to foliage only.

We have then, on the whole, a sufficiency of insects injurious to trees, which will, no doubt, be anything but satisfactory to a Forester.

And now, will you say, that we know the possible extent of the damage that could be done by those insects, what are the preventives?

It is with sorrow, that I must answer, that the use of preventives against damages caused by insect agency have not always been followed by satisfactory results. It is extremely difficult to cope with

* Determined by Mr. P. MacOwan.

the innumerable minute *Scolyti*, for instance, and only radical measures, from the very beginning of the supervision of our forests by the officers of the Department, may partially eradicate the evil. We have the results of the same measures carried out in other countries, and I will not dwell on their efficacy, more or less ascertained.

The object of this paper, which I do not in any wise deem scientific, is simply to call your attention to the number and varieties of insects injurious to Forest trees, and also to ask for some information on the life-habit of those insects.

As I have said before, nothing is known on that subject, and what is needed is: true and reliable observations in different parts of the country. One man alone cannot do much. I cannot, for the present, at least, visit those districts where forests are found, but I would gladly make out, to the best of my abilities, those species which would be sent to me for that purpose, and keep due record of the observations which my correspondents would favour me with.

And then, I hope, that by manifold researches of that kind, we will be able, in time, to know the name and be acquainted with the life-history of those insects that are prejudicial to a certain given tree, as is now the case in European Countries and in the United States of America.

EXHIBITS.

Three drawers of Beetles.
 One box of Bombycidae.
 One box containing *Ledo Venus* and *Cossus*.
 One piece of Ebony Wood.
 Two showing the galleries of *Ledo Venus*.
 One box containing *Alaus moerens*.
 Larva of *l'Alaus moerens*.

AN INVESTIGATION INTO THE ISOBARIC INFLUENCES AND CYCLONIC PATHS OF SOUTH AFRICA.

By ADOLPH G. HOWARD.—APRIL, 1885.

TO THE PRESIDENT AND MEMBERS OF THE SOUTH AFRICAN PHILOSOPHICAL SOCIETY.

GENTLEMEN,—In placing before you the following investigations into the Meteorology of South Africa, with my theories based thereon, I do not wish to convey the idea that they are facts fully proved, because such most decidedly is not the case. I wish them to be understood as representing merely the chrysalis from which a fully developed and practical law may ultimately be established, so that I merely offer them as a basis on which others (or perhaps myself) may erect a more useful superstructure.

The reason which induced me to make meteorology a study in this Colony, was the assertion of a friend of mine, soon after I arrived here, to the effect that the barometer always rose with a south-east